

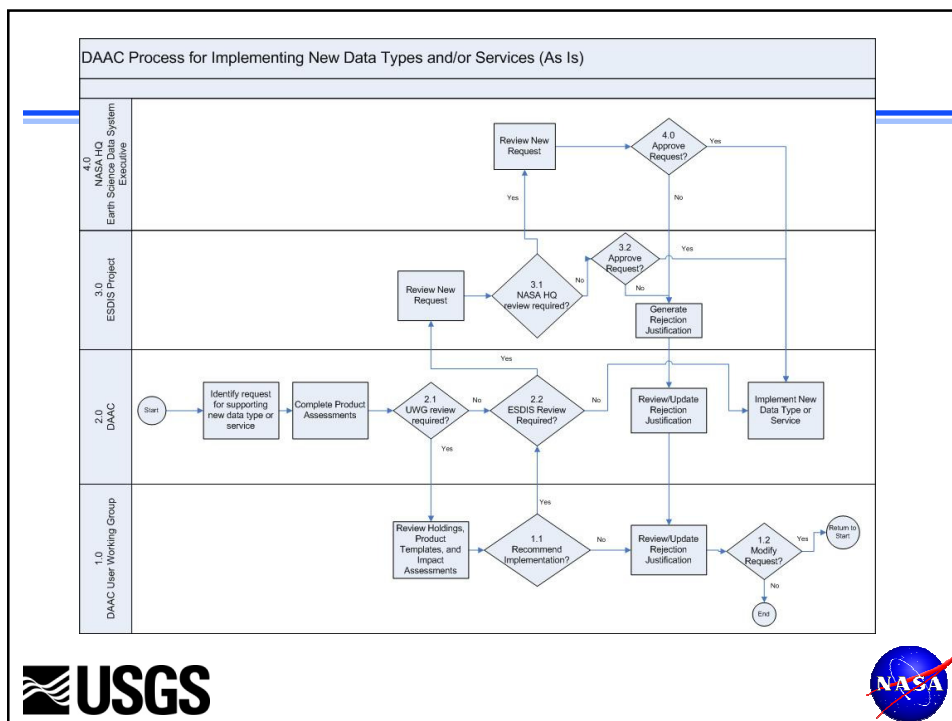
Topical discussion: New data sets & MEaSUREs

User Working Group
August 11-12, 2010

Dave Meyer, USGS
LP DAAC Project Scientist

New Data Sets: Topics

- ESDIS Process for New Data Sets
- MEaSUREs
 - Solicitation
 - LP DAAC Support
 - Community review
- Other potential products
 - ASTER Emissivity Grid
 - USGS Essential Climate Variables derived from Landsat TM/ETM+



DATA Template: *Product Developers*

- Title for specific data set (ESDT) or group of datasets
- Brief Narrative Description
- Product Algorithm Theoretical Basis
- Science Need (justification)
- Quality and Accuracy Information
(cal/val, relative and absolute uncertainty, stability, maturity of algorithm)
- Intended or Appropriate Product Use
(also including limitations on use where appropriate)
- Science Value
(use of product for science, papers written, breakthroughs, multidisciplinary use)



DATA Template: *DAAC and ESDIS-* *SOO*

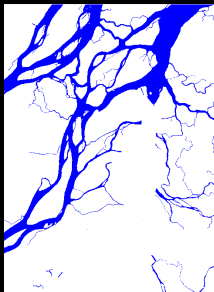
- Title for specific data set (ESDT) or group of datasets
- Heritage
 - Rationale for DAAC involvement in the data set(s)
 - Where data came from
 - Authorization or agreement for DAAC to manage these data
 - (EOS Program, DAAC User Working Group, MOUs, requests, other)
- Descriptive Metrics (as described in SOO metrics presentation)
 - Size (e.g. data volume, number of granules, etc)
 - Activity levels
- Level and Type of Service(s)
 - Characterization of Services from DAAC
- Current Involvement/Responsibility
 - DAAC developed and/or managed
 - DAAC provided infrastructure
 - Shared responsibility with other NSIDC or external programs
 - Brokered with other institutions
 - (meaning they are hosted at other institutions, with web presence on DAAC website)



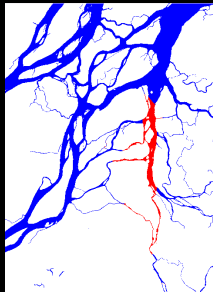
Example: Land Water Mask

- SWBM shows major gaps along rivers

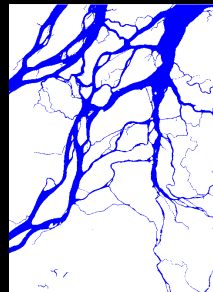
SRTM raster at 250m



Red shows MODIS



End product with
SRTM and MODIS



Data template: water mask example

Title (data set or group of datasets)	Global 250-meter MODIS Land Water Mask
Description (Brief Narrative Description)	Land/Water Mask Global 250-meter spatial resolution Sinusoidal mapping grid Geotiff format MODIS and SRTM input Output 3 values: Land, Water, Shoreline One-time production
I. Product Developers Product Algorithm Theoretical Basis	<p>Integrate existing SRTM Water Body Mask (SWBD) mask with 250-m MODIS data to make a new water mask in raster format, at 250-m resolution in MODIS tiles.</p> <p>SWBD will be gap-filled using MODIS 250-m data to make rivers more continuous.</p> <p>MODIS 250-m data will be used to create mask for areas north of 60°.</p> <p>Use 150-m MODIS mosaic of Antarctica product (NSIDC) for South of -60°, because 250-m MODIS data is unavailable.</p>



Data template: water mask example (con't)

Science Need (justification)	<p>The current water mask for MODIS was derived at 1km resolution, which represented a major improvement on previous products but:</p> <p>This mask contains errors and gross discontinuities in major rivers</p> <p>Additionally the 1km spatial resolution makes it inadequate for 250m based products.</p> <p>The SRTM Water Body Mask (SWBD) is now available via JPL at 90m spatial resolution, and also represents a significant improvement on previous masks, but:</p> <p>There are frequent gaps in the data resulting in discontinuities in major rivers</p> <p>Extends only to 60 degrees North latitude</p> <p>Product represents a major improvement for local studies but is unsuitable as a continental or global water mask.</p>
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Data template: water mask example (con't)

Quality and Accuracy Information (cal/val, relative and absolute uncertainty, stability, maturity of algorithm)	Development is focused on correcting current quality discrepancies in existing products (MODIS 250-m products and SRTM data). Gap detection and filling is automated, but will require human review to ensure complete gap coverage.
Intended or Appropriate Product Use (also including limitations on use where appropriate)	A global 250-m land water mask is required for adequate use of 250-m MODIS data, in addition to enhancing applications which use higher resolution input on continental or global scales, including regions above or below degrees latitude. Examples include all manner of large scale land cover change study, eg., drought, fire, crop yield, land use, phenology.
Science Value (use of product for science, papers written, breakthroughs, multidisciplinary use)	See Intended or Appropriate Product Use above.



Community - Background

CORE	COMMUNITY
Projects Subject to Programmatic Review	Projects Competitively Selected
Substantive NASA Oversight	'Light Touch' Oversight w/ significant Community Involvement
Tight Integration of Data System Tools, Services and Functions	Community-based Tools and Services Loosely-Coupled
Employ Well Established Information Technologies	Employ 'Edgy' or Emerging Technologies



ESDIS “Community” Solicitations

- Research, Education and Applications Solutions Network (REaSON)
 - Forty-two projects awarded in 2003-2004
 - Integration of data products, information systems and services
 - e.g., TOPS, GLCF, SERVIR
- Advancing Collaborative Connections for Earth System Science (ACCESS)
 - Enhance/improve existing distributed NASA-funded Science Info Systems
 - Solicitations most years (projects TRL > 5)
 - e.g., GRACE, HDF/OpenDAP, NACP, Sensor Web
- Making Earth Science Data Records for Use in Research Environments (MEaSUREs)
 - Focus on Earth Science Data Records (consistent science records over multiple missions)



Twenty-nine projects funded in 2007.



MEaSUREs and EOSDIS Data Centers

- **Plan per Martha Maiden**
 - **Products generated by MEaSUREs Projects will be stored and distributed to users from the projects for their duration**
 - **“Final versions” of products will be migrated to a designated EOSDIS Data Center for archiving and distribution**
 - Interfaces need to be defined between MEaSUREs Projects and EOSDIS Data Centers
 - Products to be migrated must be vetted through respective DAAC User Working Groups (by ~ 36 months after project start)
 - No guarantee that all proposed products will qualify and find a “permanent home”
 - **Some of the MEaSUREs proposals already include collaboration with one or more EOSDIS Data Centers**



MEaSURES Projects and Data Centers - Key “Generic” Milestones

Key Milestone	Due (months after start)	Comments
Establish contact with EOSDIS Data Center(s) where products will eventually be archived	6	Data Center(s) will be designated by Program Manager. Ensure that necessary interface control documents* and operations agreements* are scheduled for development. Data Center will initiate discussions about levels of service, data formats, potential user communities, identify issues unique to the data product/data set.
Deliver Algorithm Theoretical Basis Documents to Program Scientist/Program Manager	12	
Support community review of algorithms (led by Program Scientist)	12	Program Scientists may hold a review meeting with peer reviewers nominated from the science and data management communities
Start production processing of ESDRs	24	
Enter Directory Interchange Format (DIF) document(s) into Global Change Master Directory	27	
Make data publicly available to users via MEaSURES project's web site	27	
EOSDIS Data Center(s) show links to MEaSURES project's web site	27	
Get data products certified by Data Center User Working Groups (DUWGs) and validated by the relevant HQ program scientist and the PE for DS.	36	DUWGs advise EOSDIS Data Centers about relative priority of the data to be archived and distributed by them, and levels of service to be provided for the data commensurate with the Data Centers' budget.
Start migrating data products, processing source code, documentation, and ancillary data to appropriate EOSDIS Data Center(s) (upon start of production of final version of products)	48	By this time interface testing and end-to-end data flow tests should be completed between the MEaSURES project and the Data Center
Complete migrating data products to EOSDIS Data Center (s)	60	



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MEaSURES & the LP DAAC

PI	Short Title	Total volume @EOP (production continuity assumptions)	LP DAAC assistance requested for transition	Collaboration Status with LP	Next Steps
Didan	Vegetation Index & Phenology	6 Tb (total) <1Tb/year (Continuity based on VIIRS ~ MODIS)	Prototype distribution @ LP DAAC, metric collection, ECHO integration, tier 1 user service model, client. Continued production (by LP?) from VIIRS.	LP DAAC staff are Co-Investigators on MEaSURES VIP (& funded for scoped effort)	Delivery of MEaSURES VIP Client, Aug '10. Algorithm review fall '10, community review at joint UWG meeting?
Roy	Web-enabled Landsat	4.5 Tb/year 31.5 Tb (7 years) Continuity based on LDCM/OLI ~ 2x Landsat ETM.	Request from PI to have UWG assist with evaluation. Distribute raw WELD tiles from LP DAAC (with ECHO integration) – FY11	USGS Landsat Project staff are co-investigators. Prototype distribution systems at USGS/EROS (not LP). Non-LP client & architecture.	Develop long-term model for accessibility via EOSDIS as a joint USGS Landsat /LP DAAC effort. Review at joint meeting?
Townshend	Global Forest Cover Change	78Tb (GFCC+TOA+SR) 42Tb (GFCC+SR) 6Tb (GFCC only) Continuity based on LDCM/OLI as above	Ingest, file formats, ECHO integration, distribution and user service model by end of performance period.	Review April 2010	GFCC Science Review meeting, in April, presentation @ joint UWG meeting?
Kobrick	Definitive Global DEM	~1Tb (static – no production requirement for LP)	Ingest, file formats, ECHO integration, distribution and user service model by end of performance period.	Contacted	Discussion before next ASTER Science Team meeting (Dec'10)



Vegetation Index/Phenology ESDR

- PI Dr. Kamel Didan, University of Arizona
 - Multi-platform Vis (AVHRR-VGT-MODIS-VIIRS)
 - Time series (1989 – present)
 - 2 band Enhanced VI
 - Phenology Metrics
- LP DAAC Role
 - Distribution (including “operational beta” system)
 - User Services
 - Metrics Reporting
 - Outreach Support

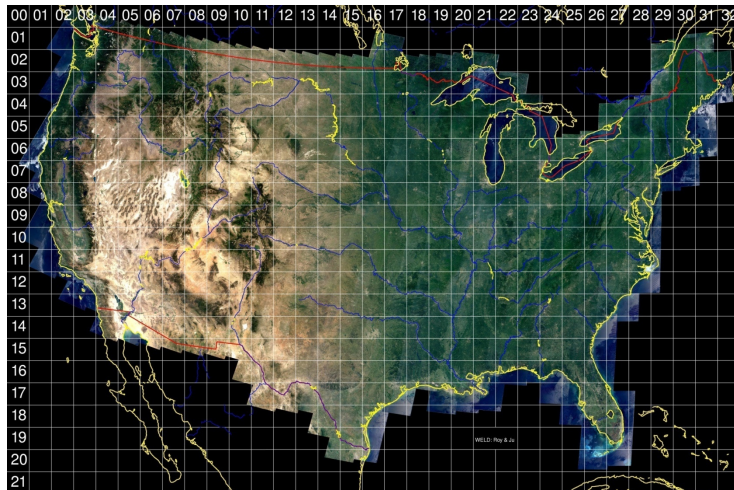


Web-enabled Landsat Data (WELD) ESDR

- PI – David Roy, South Dakota State University
- For a 7-year period (October 2006 through September 2013) they will generate monthly, 3-month (seasonal) and annual surface reflectance composite mosaics of the conterminous U.S. and Alaska by processing every Landsat 7 ETM+ acquisition.
 - Cloud screened
 - Cloud and gap filled
 - Atmospherically and geometrically corrected
 - Normalized for variations in solar and viewing geometry
 - The mosaics will be updated at the pixel level in near real-time.
- MODIS atmospheric characterization will be systematically applied to atmospherically correct the Landsat ETM+ data
- The 500m MODIS BRDF/Albedo product will be used for correction of ETM+ solar and viewing geometry and gap-filling



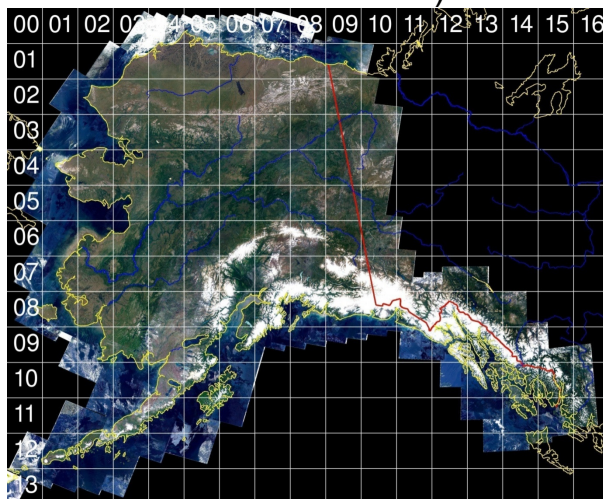
WELD CONUS Map (501 tiles in Albers)



Courtesy of David Roy, SDSU

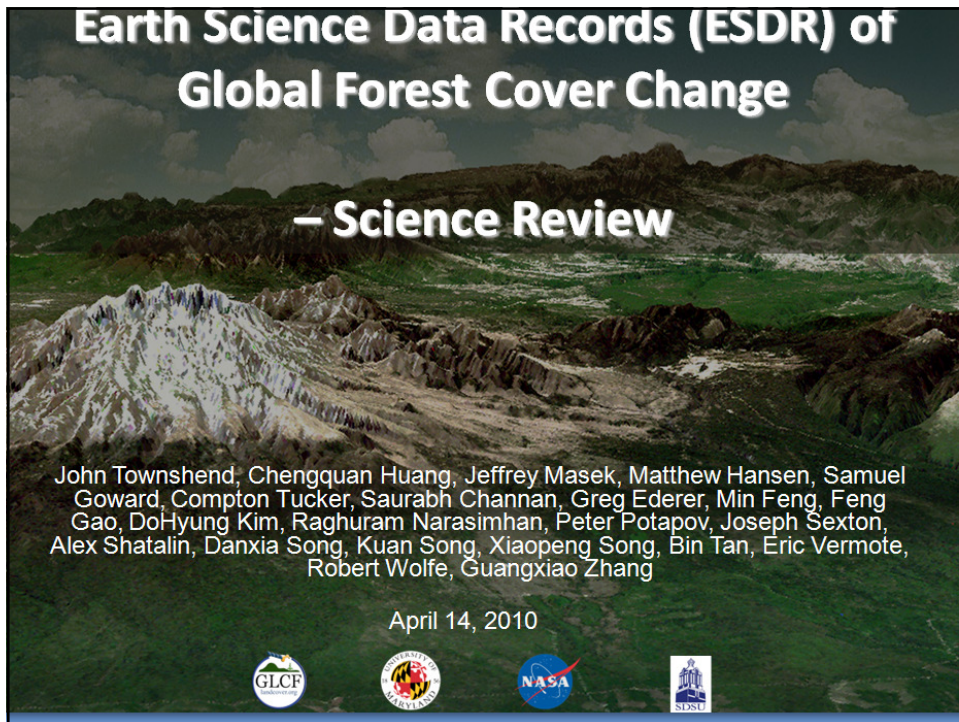


WELD Alaska Map (162 tiles in Albers)



Courtesy of David Roy, SDSU





GFCC Science Goals

- Assess global forest cover change (FCC)
 - First global scale assessment at Landsat resolutions
 - Develop the capability for routine monitoring
- Generate FCC ESDR products to support global change studies:
 - Carbon and climate modeling
 - Hydrology
 - Conservation and biodiversity
- Contribute to national and international research programs
 - GOFCC-GOLD
 - GCOS ECV
 - REDD and others

GFCC Product Distribution

- GLCF
 - FTP
 - ESDI (Earth Science Data Interface)
 - Including all deliverables
- LP-DAAC
 - Archive
 - Distribution



ESDR Integration – LP DAAC

- Assumed timeline (all ESDRs?):
 - FY12 – ingest, ECHO integration
 - FY13 – ingest, distribution
 - FY14 – user support
- For Didan & Roy - prototype distribution place by 2012
 - LPDAAC to distribute WELD tiles for Roy (seamless distribution from Landsat/LDCM)



MEaSURES ESDR Reviews

- Townsend GFCC completed in April, 2010
 - Question: are these reviews for the algorithms (remote sensing experts) or community acceptance (target users)?
- Didan VIP
 - Targeting algorithm review late fall, community review in spring (joint LP/ORNL UWG?)
- Roy WELD
 - Prepared for review, schedule TBD (likely similar to Didan)
- Kobrick DGDEM - TBD



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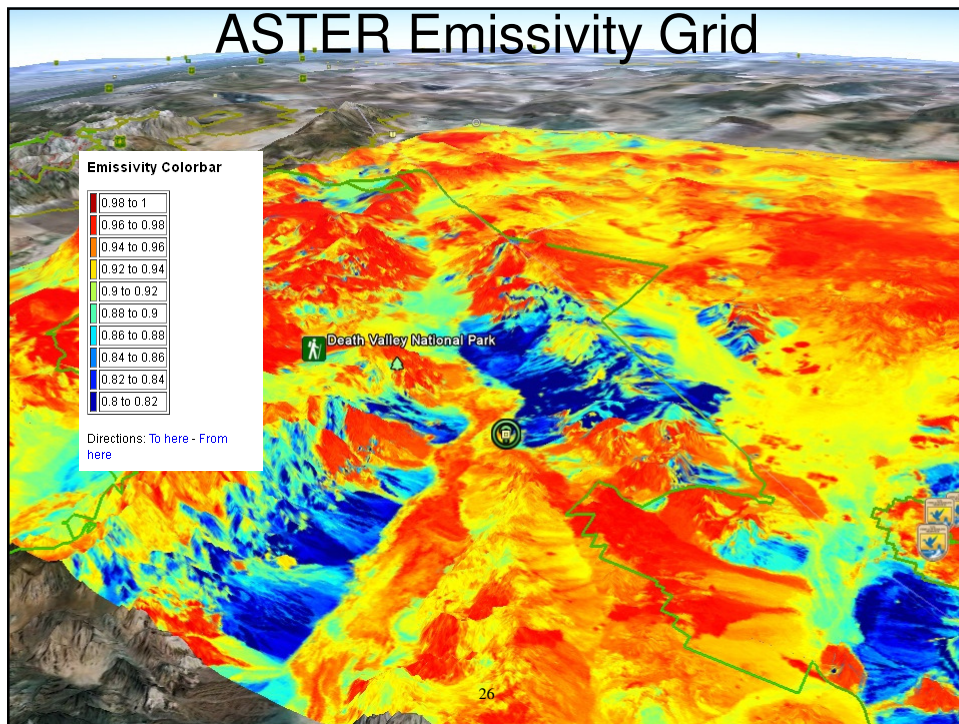
Other products for consideration

- ASTER Emissivity Grid
- USGS Essential Climate Variables from Landsat
- Others?



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ASTER Emissivity Grid (Hulley/Hook)

- LST&E products are key to global climate change studies, climate modeling, surface-atmosphere interactions and land use, land cover change.
- Knowledge of surface emissivity is critical in recovering the Land Surface Temperature, import for many scientific studies from climatology to hydrology to studying the greenhouse effect.
- Currently, North America is complete, Africa underway soon
- Potential candidate for inclusion in LP DAAC
- Global production – “move algorithms to archives”

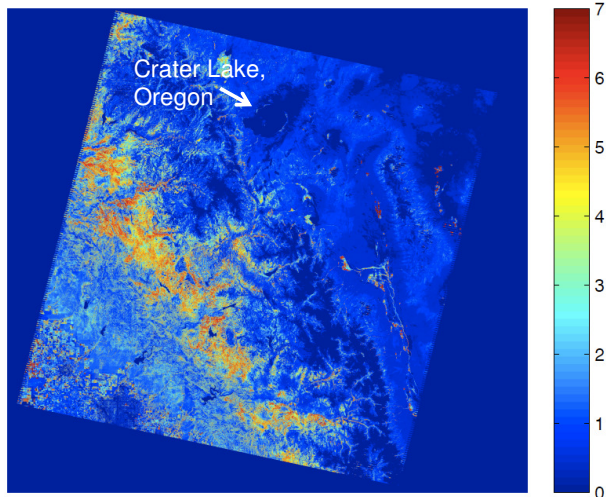
Essential Climate Variables from Landsat

- USGS is developing a suite of "essential climate variables" (ECVs), largely based on Landsat

- Although not "MEaSUREs" ESDRs, still of interest to the land processes community.

- Should these be discoverable and distributable through EOSDIS?

- Example: Leaf Area Index from Landsat using Nemani's MODIS algorithm



Courtesy of Rama Nemani, NASA Ames



Candidate Landsat ECVs

Terrestrial ECV	Technical Consideration			Requirements / Demand		
	Landsat Potential	USGS Readiness	USGS Uniqueness	USGS Relevance	Importance to DOI	Overall Community Demand
*Land Cover	High	High	High	High	High	High
*Leaf Area Index	High	Low	Low	Medium	Medium	Medium
FPAR	High	Low	Low	Medium	Low	Low
Biomass	Low	Low	Low	High	High	High
*Albedo	Medium	Low	Low	Medium	Low	Low
*Fire Disturbance	Medium	High	Medium	High	High	High
*Lake Variables	High	High	Medium	High	High	Medium
*Snow / Ice	Medium	Medium	Low	Medium	Medium	Medium
Soil Moisture	Low	Medium	Low	Medium	Medium	Medium

*ECVs identified as priorities by the ECV team



Landsat Fundamental Climate Data Records

- Land Surface Reflectance FCDR
 - LEDAPS heritage (MODIS LSR algorithm applied to TM/ETM+)
 - Currently in development
- Land Surface Temperature FCDR
 - Algorithms proposed include the use of an ASTER-derived emissivity map (NAALSED – Hilly/Hook)
 - Development targeted to begin in FY11



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Other products?

- Note: if a product is available elsewhere, it should be considered as an “access” issue (discussed tomorrow).



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New products:UWG recommendations

P.1	Encourage a review of the 10-yr old standard products in the context of fulfilling user needs – does the current suite of products from MODIS & ASTER serve the needs of the applications community as well as those of the Earth science community?	guidance from ESDIS & Science Teams on product reviews	
P.2	Facilitate transition between AVHRR, MODIS, and VIIRS to ensure continuity for the user community.	in part addressed by MEaSURES (for VIP)	NOAA CDR?
P.3	Establish an appropriate process to submit products and services for peer review.	such processes exist	supporting documentation
P.4	Data packaged by common user parameters, i.e., band combinations, regional mosaics, file format, map projections through MRTweb	under consideration	OGC Geobrain framework under DEM Explorer is capable of this
P.5	Higher-level ASTER VNIR-SWIR-TIR bundled product	under consideration	
P.6	Multi-temporal packages over active regions of disturbance or areas of change	Guidance: why can't you do this now?	as per Brackenridge
P.7	Resolution-based, sensor-independent, gap-filled, smoothed mosaics (WELD-like)	addressed by non-DAAC projects (MODIS)	VegDRI, FEWS
P.8	Regional mosaics (pre-computed)	need clarification from the UWG	areas? Application?



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MEaSURES Products and Data Centers

- Algorithms to be used for generating ESDRs must be certified by community through processes managed by Program Scientists and Program Executive
- Products generated by MEaSURES Projects will be stored and distributed to users from the projects for their duration
- “Final versions” of products will be migrated to a designated EOSDIS Data Center for archiving and distribution
 - Products to be migrated must be vetted through respective DAAC User Working Groups
 - No guarantee that all proposed products will qualify and find a “permanent home”
 - Continued production of ESDRs beyond the duration of MEaSURES projects will be through follow-up calls for MEaSURES-like proposals and peer-reviewed selection
- Requirement for MEaSURES to work with Data Centers are included in co-operative agreements in a milestone table
 - Working out interface requirements and details are left to Data Centers and PI's.
- Three charts following milestones show the Data Center assignments and “Contact Status”
 - Status is rated 1 through 5 (Ramapriyan's assessment) based on PI reports
 - 1 indicates initial contact made; 5 indicates details have been worked out and some services at data centers are already being provided



AGU Fall 2009 Townhall - Key Questions for Discussion (1 of 3)

- What needs to be done to facilitate use of MEaSURES products?
- What needs to be done to enable/encourage products from multiple MEaSURES investigations by other users?
- What are the experiences MEaSURES teams have had in getting their input products and incorporating them into their work?
 - What improvements could be made (e.g., at the DAACs) to help with this?



AGU Fall 2009 Townhall - Key Questions for Discussion (2 of 3)

- How are MEaSUREs-DAACs interfaces working out in getting ready for sending ESDR products to DAACs?
- How do we define quality metrics for ESDR products? Should/Can a common approach be used for all MEaSUREs projects?
- How do we deal with multiple (& potentially conflicting) products?
- What happens to processing after MEaSUREs projects are finished?



AGU Fall 2009 Townhall - Key Questions for Discussion (3 of 3)

- These are specific to “preliminary release” of ESDR products
 - Should the data be stored at a DAAC before it is final?
 - What should the preliminary format be?
 - What constitutes a preliminary public data set? What level of confidence?
 - Should the data be peer reviewed at some level in journals?
 - Should subsets be put onto public websites before the total product is complete?
 - What kind of documentation should be available for the preliminary data sets?

